US Army Corps of Engineers
North Pacific Division

Salmon Passage Notes

Snake and Columbia River Fish Programs

March 1993

This issue of Salmon Passage Notes features an explanation of the Water Budget—another of the programs in place in the Columbia and Snake River system which seek to improve migration conditions for salmon. Although the water budget has been in use for over a decade, interest in its use has increased since the listing of three Snake River salmon species under the Endangered Species Act in December 1991 and May 1992. Flow augmentation increases water velocity in the river system and, in theory, aids juvenile fish in their migration to the ocean by reducing their travel time.

This issue also addresses operation of the Federal hydropower system for fish in the 1993 operating season that begins April 15. The water budget becomes a part of that plan of operations and as such was examined in the 1993 Supplemental Environmental Impact Statement now in final form for public review. (For information on the SEIS call Pete Poolman in our Walla Walla district at 509-522-6619.)

We also provide an update of the System Configuration Study, and the lawsuits heating up in the region over fish.

THE WATER BUDGET AND FLOW AUGMENTATION

In the early 1980s, the Northwest Power Planning Council, in consultation with Congressional leaders, project operators, fishery agencies, Indian Tribes, and Northwest utilities, established the concept of a Water Budget as part of its Fish and Wildlife Program.

The Water Budget called for specific amounts of water to be released from upstream storage reservoirs to increase and shape river flow during the spring, the major juvenile fish migration period. The idea was to partially restore and simulate the effects of a spring freshet, the heavy runoff from spring rains and melting snow that naturally replenished river flows and helped push the juveniles to the ocean before the dams were in place.

Endangered Species Act listings

With the Salmon Summit meetings in 1990, the region began to focus more on the concept of augmenting river flows to help move juvenile fish downstream. The 1991-92 Endangered Species Act listings of the Snake River sockeye salmon as endangered, and the spring/summer and fall chinook species as threatened, prompted further attention.

Water Budget and flow augmentation became important not only to mimic the spring freshet but as a tool to assist in later spring and summer migrations and adult returns.

The Process

The initial water budget concept has further evolved through amendments to the Council's Fish and Wildlife Program and today provides for an integrated, systemwide plan to provide help to anadromous stocks and in particular naturally spawning salmon that are listed as endangered or threatened.

Starting in January, federal project operators, the Fish Passage Center, the Council's Water Budget Advisor, National Marine Fisheries Service (NMFS), Bonneville Power Administration, and utility representatives review the current year's runoff forecasts and coordinate plans for reservoir system operation consistent with the Council's Fish and Wildlife program. This will be the tenth year of formal water budget implementation through a Coordinated Plan of Operation (CPO).

Water available for the water budget and for flow augmentation is determined by considering water supply forecasts, flood control requirements, probability of refilling reservoirs for the following year's operation, impacts to recreation and other uses of storage reservoirs. Consultation with NMFS under the Endangered Species Act has become a critical part of the process.

During the operating season the Fish Passage Center, representing fisheries agencies and Indian Tribes, monitors smolt activity and calls for water budget and augmented flow releases when additional flows are expected to be most beneficial to the migrating juvenile spring/summer and fall chinook salmon. They also request releases to regulate flows and temperatures for adult fall chinook.

Where the Water Comes From

To provide water budget flows, water is held back in storage reservoirs during the winter months for later release during the outmigration period. This reduces the amount of energy available from the hydroelectric system during the winter months when regional demand is higher and forces the production of energy (as water budget flows are released through turbines) during the spring when demand is lower.

The Snake River water budget relies upon Dworshak and Brownlee Reservoirs and any additional unallocated water from the upper Snake River Basin. Grand Coulee and the upstream reservoirs provide flows on the Columbia River.

Before the Endangered Species Act listings, an annual water budget of 3.45 million acre-feet (MAF) was made available on the Columbia River and about 1.19 MAF from the Snake River. Since the listings, additional flow augmentation of up to 3.0 MAF in the Columbia and

varying amounts from the upper Snake has been supplied. An acre-foot of water is equal to 325,850 gallons and would cover a one-acre area to a depth of one foot.

1992 Operations

Operation of the Columbia and Snake reservoir system in 1992 was the initial year for flow augmentation beyond the spring water budget and added flows in the July, August and September timeframes as well, focusing on the lower Snake River flows.

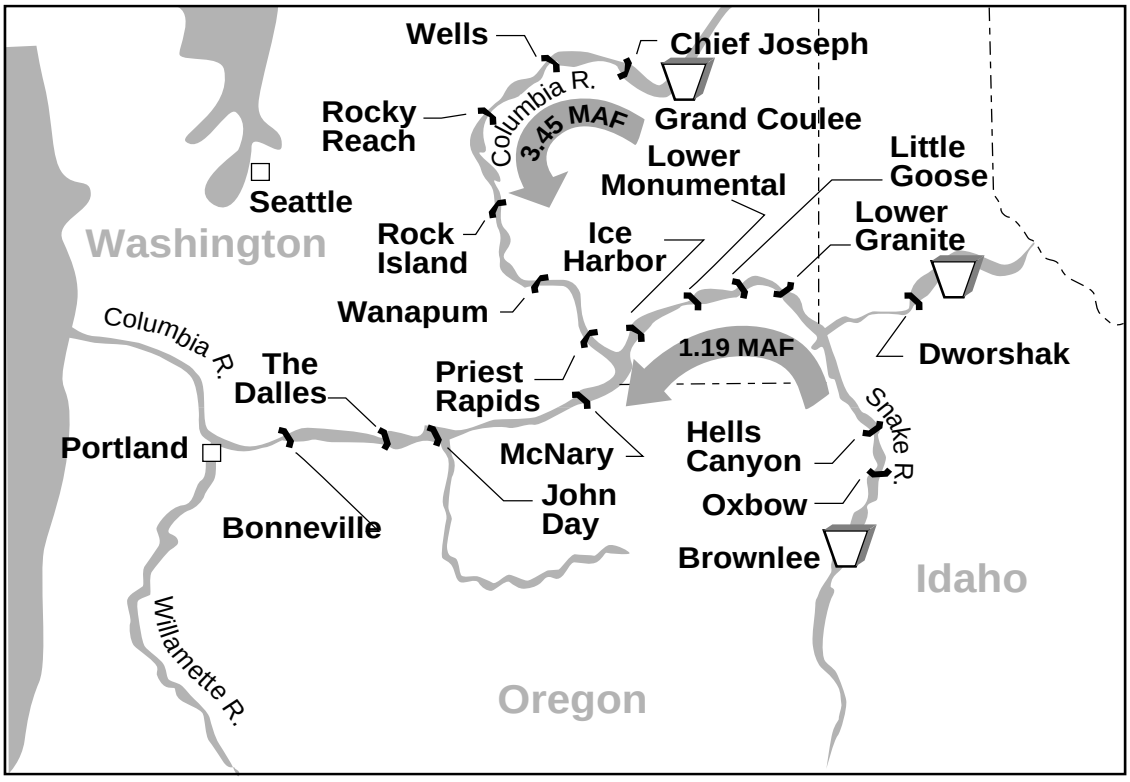
During the 1992 spring water budget period (May 1 to June 30) 3.45 MAF of water budget was provided, and 3.0 MAF of flow augmentation water was released to the Columbia River from Grand Coulee and Arrow.

Between mid-April and mid-June, base outflow plus water budget volumes resulted in over one million acre feet of water released into the Snake River from Dworshak for the spring migrations. One hundred and ten thousand acre feet was released from Brownlee dam.

In July, about 270 thousand acre feet was released from Dworshak, for flow augmentation for the juvenile fall chinook migration and to provide cooler water into the Snake River which was expected to benefit fish. The temperature of water released from Dworshak dam can be controlled by drawing water from various reservoir depths (with cooler water being at lower elevations). Also during July about 140 thousand acre feet was released from Brownlee.

And again in September, 200 thousand acre feet was released from Dworshak to improve conditions for returning adult Snake River salmon. All of these actions were taken in consultation with the NMFS to ensure compliance with the Endangered Species Act.

Depending upon expected run-off and reservoir levels, some storage space for flood control may be shifted from one dam to another. Shifting this storage space from Dworshak to Grand Coulee frees up space to store water at Dworshak, while still meeting flood control storage requirements. Because of low run-off forecasts in 1992, there was no need for flood control space at Dworshak and thus no shift was possible.



The Water Budget, begun in 1982, provides additional flow in the spring to move juvenile salmon downriver to the ocean.

Proposed Flow Augmentation for 1993

The 1993 Supplemental Environmental Impact Statement's preferred alternative for flow augmentation includes 1992 actions that were implemented and adds more flexibility for summer flows with augmentation water from Dworshak.

Two primary differences are:

1) 200 thousand acre feet normally planned for September release could be shifted to July and/or August to benefit summer juvenile migrants; and

2) the criterion for the flood control transfer from Dworshak to Grand Coulee is modified so the probability of flood control transfer is improved.

In both spring and summer, timing of flows will depend upon actual runoff conditions, and numbers and movements of fish. The Fish Passage Center will monitor these conditions and request water releases accordingly. Consultation with NMFS will continue.

Pros and Cons

Most state, tribal and Federal fisheries agencies and many salmon advocates believe the increased flows help "flush" fish down the river and reduces their exposure to predators and other hazards in the usually slow-moving flows within the reservoirs.

Just as there are supporters of augmented flows to benefit the salmon's downstream migration, there are critics. They point to a lack of credible cost/benefit analysis or biological evidence that augmented flows result in increased fish returns.

Some recent data suggests that juvenile fish are not passive during their downstream migration. Unlike a stick thrown into the river which floats downstream only where and as rapidly as the flows take it, fish may stop and rest or dally along the way and voluntarily time their downstream descent to match their biological time clock regardless of flow velocities.

Clearly, as with so many of the other alternatives being considered to save the salmon, there is still a need for more biological information or "science" to confirm benefits of augmented flows to fish and just how much augmentation is needed to provide the benefits. NMFS will be conducting research on the relationship of flow/water particle travel time to survival beginning this year.

1993 OPERATIONS FOR FISH

How is the coming passage season looking for upper Snake River salmon juveniles ready to begin migration to the ocean? What is being done to help move them safely past the dams, the maze of predators and other obstacles?

The Corps is looking ahead to the spring and summer operating season to plan flows for fish. The final Supplemental Environmental Impact Statement (SEIS) and Biological Assessment just released for public review, lay out a preferred plan of operations jointly prepared by the Corps, Bonneville Power Administration and Bureau of Reclamation. NMFS also informally cooperated in preparing the SEIS.

This year is shaping up to be another challenging year. Current forecasts indicate that this will be the seventh consecutive year of below average Snake River flows at Lower Granite and the second such year for flows at The Dalles on the Columbia River. Petitions to list the White Sturgeon and Bull Trout under the Endangered Species Act have agencies considering water levels in lake habitats of these resident fish while attempting to provide sufficient flows downstream for salmon. Additionally, a Notice of Intent to sue the NMFS, to prevent issuance of a permit to the Corps for collecting juvenile fish and barging them past the dams, may add a note of uncertainty. (See update on Litigation, this issue.)

Flow Measures

The preferred plan for 1993 is similar to 1992 operations. River flows would be augmented to help move migrating juvenile fish, by timing water releases from upstream storage dams on the Columbia and Snake River dams. (Please see related article on the Water Budget.) From early April to the end of July lower Snake River reservoirs would be operated at the minimum levels for which they were designed to operate; and the John Day pool on the lower Columbia would be operated at lower than its normal level. These flow and operation regimes are designed to increase water velocities during juvenile migration periods. Releases of water in the late summer may also help to augment flows and regulate river temperatures during juvenile and adult salmon passage periods. At certain times, water will be "spilled" over the dams to push young fish over the spillways.

Non-flow Measures

We will continue a program called Project Improvements for Endangered Species (PIES) to make a number of mechanical, structural and operational improvements to fish passage systems. Construction of bypass facilities is scheduled to continue at Ice Harbor under the Juvenile Bypass Program. Research progresses on a variety of topics related to improved survival of salmon species, under the Corps' Fish Passage Development and Evaluation Program.

And, provided that NMFS issues a Section 10 permit requested by the Corps under the Endangered Species Act, the Juvenile Fish Transportation program will continue. Through this program the Corps collects smolts at upstream dams and barges them past the remaining downstream dams.

The challenge will be to do even more to monitor and shape water flows in a potentially low water year and to continue studies for fish in cooperation with the region, while responding to multiple lawsuits and continuing to meet the needs of a variety of river users.

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Releases of water from Dworshak Reservoir in Idaho help to augment flows and regulate water temperatures during Snake River salmon migrations.

"This year is shaping up to be another challenging year. Current forecasts indicate that this will be the seventh consecutive year of below average Snake River flows at Lower Granite and the second such year for flows at The Dalles on the Columbia River."

SYSTEM CONFIGURATION STUDY

In our last issue (December 1992) we summarized the information contained in the Corps' Interim Status Report to the Northwest Power Planning Council, on the Columbia River System Configuration Study (SCS). The SCS is a two-phase study of alternatives for physically modifying or reconfiguring the Federal hydropower projects on the Columbia and Snake Rivers to better operate for fish.

The Interim Status Report presented information available to date from Phase I of the study. The report provided preliminary design, cost and scheduling estimates for the alternatives under consideration.

The complete Phase I study report is scheduled for completion and public distribution in the fall of this year. In addition to information covered in the Interim Status Report, it will contain mitigation plans and a preliminary analysis of economic and environmental effects, including effects on salmon survival, for each of the alternatives. The draft final report will compare each alternatives with the others and make recommendations for which options will be carried into Phase II for further study.

The Corps gave a brief presentation to the Northwest Power Planning Council on the Interim Status Report on December 9 in Portland. An independent contractor, Harza Northwest, also briefed the Council and the Corps on the results of its independent review of the Corps' interim study results.

Independent review by HARZA

Harza Northwest was retained by the Snake River Drawdown Oversight Committee (a Council committee) to review Corps analysis of each SCS alternative.

The Harza analysis report found that since this is a reconnaissance-level study, the conservative engineering and cost estimates the Corps used were appropriate, but there could be room for innovation in engineering techniques and cost and construction-time savings in later study and design phases. The report provided Harza's preliminary investigation of existing biological information on flow-survival relationships and causes of salmonid mortality, and indicated that available information is conflicting and inconclusive.

The Harza report recommended that a few of the alternative drawdown scenarios and the migratory canal alternatives be dropped from the study. Harza made specific recommendations for refining or expanding certain elements of the study, and for building upon existing biological studies and adding new ones to fill in information gaps.

On February 8 members of the Corps study team met to discuss these and other report recommendations with Harza, the Drawdown Committee and the Technical Advisory Group (TAG). (TAG includes representatives from the Corps, other Federal and State agencies, interest groups and the biological community.)

At this time the Corps plans to continue the reconnaissance-level study of all alternatives covered in the Interim Report, so the region can have a more complete report on the various alternatives before dismissing any of these. In addition, the study will be expanded somewhat to include variations of the alternatives.

Additional Ideas Under Study

At the request of the Drawdown Committee, the concept of a single-pool drawdown (Lower Granite) was added to the alternatives under analysis. A one-pool drawdown would probably act as a precursor to the four-pool drawdown under study, but could allow the drawdown concept to be implemented more quickly and provide research opportunities.

The study will be expanded to consider Harza's suggestion of using side channel spillways to allow juveniles to bypass the dams altogether. Channels would be built into the embankments flanking the dams with some sort of system to guide juveniles to the entrance to the channel and assure that adults continue to use the adult ladders.

Recommendations from Harza and others for using and expanding upon existing biological studies and for additional studies are being considered by the various regional players. Decisions at the end of Phase I of the SCS for deleting or adding alternatives for further study will be based on existing biological data.

Final Phase I Draft, Public Meetings

Phase I studies are continuing, headed by the Corps' Walla Walla district. A final draft report is expected to be released to the region in the fall and will be followed by a series of public meetings. Your participation in these meetings will help to determine which alternatives will be retained or added for further study in Phase II of the SCS. We will keep you posted on the study report and meeting locations and schedules.

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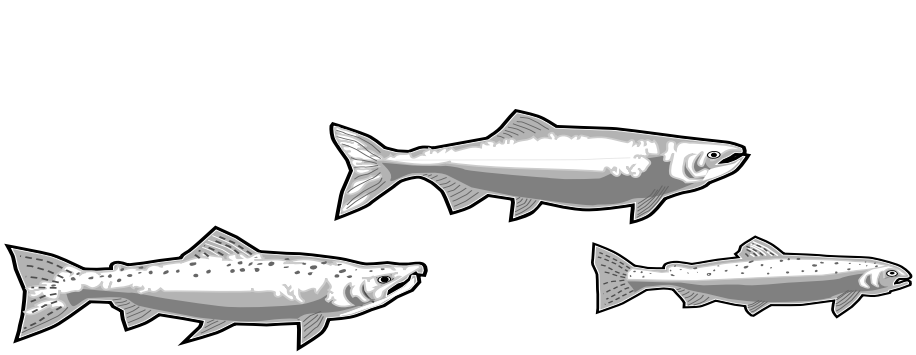

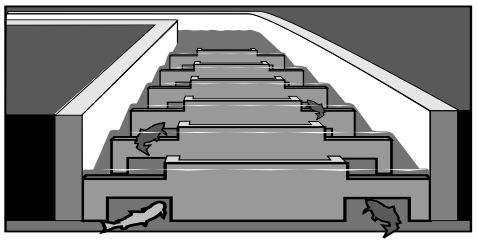

LITIGATION UPDATE

In our September 1992 issue we described a number of lawsuits that have been filed against various Federal agencies under the Endangered Species Act concerning Columbia River System operations. As predicted, the number has grown, and the Corps, National Marine Fisheries Service, Bonneville Power Administration, Bureau of Reclamation, U.S. Department of the Interior's Fish and Wildlife Service and Bureau of Land Management and U.S. Department of Agriculture Forest Service are all facing potential battles in court. The Northwest Power Planning Council faces legal actions under the 1980 Northwest Power Planning Act.

The grounds for suits against the Federal agencies include harvest-, hatchery- and habitat-related actions or lack thereof, too much or too little augmented water flows for fish, insufficient consultation under the Endangered Species Act, and others.

Plaintiffs and intervenors include: the Sierra Club Legal Defense Fund, Direct Service Industries, the Public Power Council, regional port and irrigator associations, Pacific Northwest Generators, Northwest Forest Resource Council, Coalition for Idaho Water, Salmon for All, and the States of Washington and Oregon. (Some plaintiffs have filed for intervention in others' suits.) Several Indian Tribes and the Idaho Department of Fish and Game have filed for amicus status in some of the suits.

Suits have been filed in the United States District Court for the District of Oregon, the United States District Court for the Western District of Washington, and the Ninth Circuit Court of Appeals. The Justice Department is working with the Federal agencies to coordinate responses.

NMFS has now also received a 60-day Notice of Intent to sue concerning a permit application to continue the Corps of Engineers fish transport program. The Notice of Intent came from the National Resource Information Center, Inc., headquartered in Idaho.

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NEED FOR BIOLOGICAL INFORMATION

The lack of biological data to support decisions for listed Snake River salmon species is a serious challenge in the search for solutions. The Corps believes that more information on biological effects is needed to make meaningful decisions on flow augmentation, bypasses, spill, drawdown options, the juvenile transport program, and others. Biological information on ocean survival of adults and hatchery impacts on wild populations is also lacking.

Complicating factors

Several factors complicate the search for sound biological data. The life cycle of salmon takes them from their place of origin, sometimes far upriver, to a two-to-five year adult life in the ocean before returning to spawn. Measuring the effects of an experimental action taken on a juvenile population often includes collecting data on returning adults to get a more complete picture. This can add five years to the length of a study before results are available for analysis.

Protection of listed species under the Endangered Species Act adds another consideration. The National Marine Fisheries Service may not be able to allow tests that might further endanger survival chances of a species already suffering from reduced populations. For example, modifications to the way dams are operated to determine effects on juvenile populations must carefully consider the potential side effects on returning adult populations.

Do We Need Biological Certainty

The Corps believes that the region should have a good idea of how fish will benefit by a certain course of action. While there is some information available, there is a need for more and better biological or scientific data to show that actions taken for fish will be beneficial and not harmful. Some potential actions are extremely costly and may neither benefit nor harm the fish, but would diminish the other beneficial uses of the river.

The Corps is working with the region through the Endangered Species Act consultation process, coordination and cooperation with other Federal agencies, participation in the Technical Advisory Group (of representatives from Federal and State agencies, interest groups and the biological community), and support of regional initiatives, to review available biological data and seek needed additional information.

Biological Tests

The Corps recently received a request from NMFS to cooperatively develop test procedures to better understand fish survival through the reservoirs under various conditions. One of the test conditions could include drawing down one or more reservoirs to levels below minimum operating pool to determine biological impacts of the drawdown. The test would require appropriate National Environmental Policy Act and Endangered Species Act documentation.

Our Walla Walla office is cooperating with NMFS in facilitating the planning and development of biological test procedures. We will provide further information as it becomes available.

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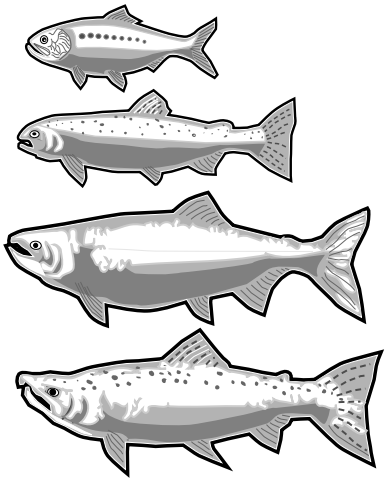
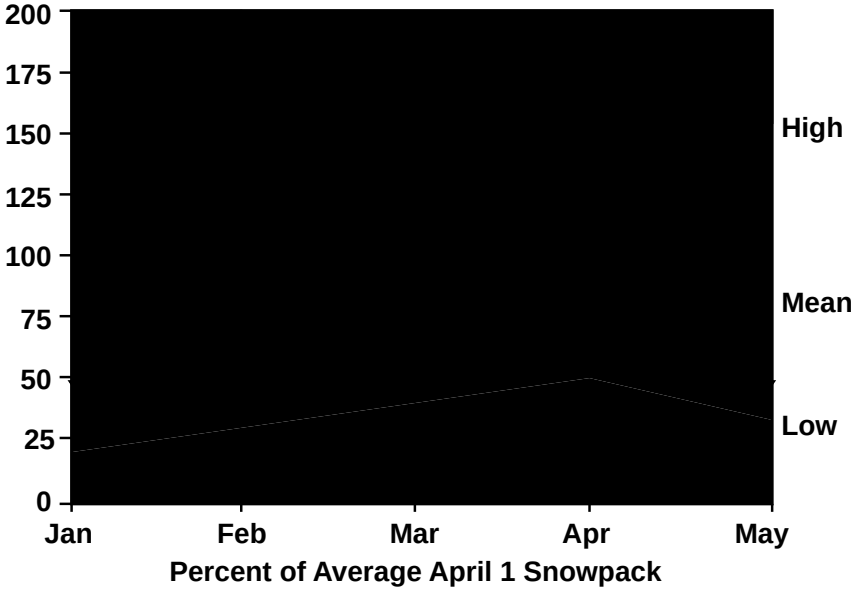


Columbia Basin Snowpack



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